DIRECT TESTIMONY OF

GEORGE A. LIPPARD, III

ON BEHALF OF

SOUTH CAROLINA ELECTRIC & GAS COMPANY

DOCKET NO. 2018-2-E

Q. PLEASE STATE YOUR NAME, BUSINESS ADDRESS, AND POSITION WITHIN SOUTH CAROLINA ELECTRIC & GAS COMPANY ("SCE&G" OR "COMPANY").

A. My name is George A. Lippard, III. My business address is Post Office Box 88, Jenkinsville, South Carolina 29065. I am the Vice President of Nuclear Operations for South Carolina Electric & Gas Company ("SCE&G" or the "Company") at the Virgil C. Summer Nuclear Station ("VCSNS" or "V.C. Summer").

Q. DESCRIBE YOUR EDUCATIONAL BACKGROUND AND YOUR BUSINESS EXPERIENCE.

A. I earned a Bachelor of Science degree in Mechanical Engineering from Clemson University in 1979 and a Master of Business Administration degree from the University of South Carolina in 1982. I joined SCE&G in 1983 as a Nuclear Training Instructor at VCSNS. I received a Senior Reactor Operator Certification in 1986 and a Senior Reactor Operator License in 1992 from the United States

Nuclear Regulatory Commission ("NRC"). Since joining the Company, I have held positions in the Operations, Outage Management, Licensing, and Training organizations at V.C. Summer. I have also served in the leadership roles of Operations Manager and General Manager at VCSNS. On January 30, 2016, I was promoted to Vice-President of Nuclear Operations for Unit 1.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to review the operating performance of VCSNS during the period from January 1, 2017, through December 31, 2017 ("Review Period").

Q. WHAT ARE SCE&G'S OBJECTIVES IN THE OPERATION OF VCSNS?

A. SCE&G's primary objective at VCSNS is safe and efficient operation. The Company also strives for excellence in all phases of operation of the facility. The station's key focus areas of safety, reliability, outage and work management, work force development, and organizational effectiveness constitute the Company's core business plan elements. SCE&G's constant improvement in these areas over the years has facilitated VCSNS's outstanding service record. Furthermore, SCE&G's business objectives are focused on maintaining a competitive production cost for the generation of electricity using nuclear fuel.

Q. WHAT HAS BEEN THE COMPANY'S EXPERIENCE WITH THE PERFORMANCE OF THE VCSNS?

A. VCSNS has performed well during the Review Period. SCE&G continuously meets or exceeds all NRC requirements and Institute of Nuclear Power Operations ("INPO") standards. Consistent with the provisions of Section 58-27-865 of the South Carolina Code of Laws Annotated, as amended, V.C. Summer's net capacity factor based on reasonable excludable nuclear system reductions during the Review Period was 101.29%, and the gross generation output was 7,190,539 megawatt hours.

Q. PLEASE EXPLAIN THE ROLES OF INPO AND THE NRC WITHIN THE NUCLEAR INDUSTRY AND DESCRIBE ANY RANKINGS RECEIVED BY VCSNS FROM THOSE AGENCIES.

A. INPO is a nonprofit corporation established by the nuclear industry to promote the highest levels of nuclear safety and plant reliability. INPO promotes excellence in the industry in the operation of nuclear electric generating plants. For the applicable reporting period, INPO rated VCSNS's overall performance as excellent.

The NRC is responsible for the licensing and oversight of the civilian use of nuclear materials in the United States. During the Review Period, the NRC reported that VCSNS operated in a manner that preserved public health and safety and fully met all cornerstone objectives.

Q. DID VCSNS EXPERIENCE ANY PLANNED OUTAGES DURING THE REVIEW PERIOD?

A. Yes. During the Review Period, VCSNS experienced one planned outage. On April 7, 2017, the unit began to reduce its generation output in a controlled manner, and the generator output breaker was opened at 1:20 a.m. on April 8, 2017, to conduct V.C. Summer's 23rd scheduled refueling outage ("RF23").

Q. HOW MANY DAYS DID VCSNS OPERATE PRIOR TO RF23?

A. With the opening of the generator output breaker on April 8, 2017, SCE&G completed its second "breaker to breaker" cycle in the history of VCSNS. A "breaker to breaker" cycle is an industry term recognizing a plant that operates continuously between refueling outages and only occurs when plant reliability is very high. Prior to opening the generator output breaker on April 8, 2017, VCSNS had been connected to the electric grid without interruption for 493 days. For comparison purposes, the longest uninterrupted run record for VCSNS is 501 days and was set on October 13, 2012.

Q. HOW LONG DID RF23 LAST?

A. RF23 lasted fifty-four and one-half (54½) days during which time the Company met all technical objectives and completed scheduled maintenance activities. The reactor returned to criticality at 4:32 p.m. on May 31, 2017, and the outage ended with the closure of the generator output breaker at 11:59 a.m. on June

1, 2017. I am pleased to report to the Commission that the planned outage, which was scheduled for fifty-eight (58) days, was accomplished three and one-half (3½) days ahead of schedule. The outage was completed with no nuclear safety significant events.

Q. PLEASE EXPLAIN THE KEY MAINTENANCE AND MODIFICATION TASKS SCE&G ACCOMPLISHED DURING RF23.

A. During the refueling outage, approximately one-third of V.C. Summer's 157 fuel assemblies were replaced, and scheduled maintenance work that cannot be performed when the plant is in operation was conducted. During this time, over 13,000 tasks including preventative maintenance, corrective maintenance, plant modification, and surveillance testing tasks were completed successfully. SCE&G completed a number of key maintenance and modification tasks during RF23, a few of which are described below.

- **Replacement of Reactor Vessel Head.** During RF23, SCE&G replaced the reactor vessel head at VCSNS, which was the original reactor vessel head installed during the construction of the plant and was approaching the end of its planned useful life. By installing a new reactor vessel head at V.C. Summer, SCE&G now has the ability to take advantage of the new reactor vessel head's more efficient design. For example, this new integrated design eliminates the additional shielding and ventilation duct work that had to be removed

with the reactor vessel head each outage, provides safety railings in common work areas, and adds a platform to the top of the reactor vessel head to allow for an improved connection to the lifting rig. Overall, this new design will allow for easy access for inspections and work activities, which will decrease worker exposure and increase personnel safety. Additionally, the installation of a new reactor vessel head allows SCE&G to return to its normal NRC-approved inspection schedule.

- **Replacement of Cable.** This scope of work consisted of replacing over 5,000 feet of cable which carries 7,200 volts from transformers external to the plant to key safety related components. SCE&G anticipates that this cable will last the life of the plant.
- **Upgrades to Switchyard Breakers.** VCSNS completed a multi-year initiative to convert all breakers in the V.C. Summer switchyard from the existing, older oil-cooled breakers to new sulfur hexafluoride (SF_6) breakers. The new breakers are more reliable, easier to maintain, and have a smaller footprint.
- **Improvements to Emergency Feedwater System.** This scope of work consisted of installing new automatic recirculation control valves and flow limiting devices. These components will improve safety margin and will enhance the overall risk mitigation profile of the plant. Additionally, a cured-in-place pipe liner was installed in a

stagnant leg of the system which enhances the system's ability to perform with improved safety margin during adverse conditions.

Q. WHEN WILL THE NEXT REFUELING OUTAGE OCCUR?

A. SCE&G's next refueling outage, Refueling Outage No. 24 ("RF24"), is scheduled for October 5, 2018. Refueling outages are scheduled every 18 months to replace depleted fuel assemblies. Maintenance and testing that cannot be done with the plant on-line are also conducted during the refueling outage.

Q. DID VCSNS EXPERIENCE ANY ADDITIONAL OUTAGES DURING THE REVIEW PERIOD?

A. Yes. During the Review Period, VCSNS experienced three mid-cycle maintenance outages, which I explain in further detail below.

Mid-Cycle Outage No. 1. At 8:57 a.m. on June 29, 2017, VCSNS automatically tripped due to low feedwater flow to the "B" steam generator. The plant trip response was normal and resulted from the closure of the main feedwater flow control valve to the "B" steam generator due to loss of air. The cause of the outage was traced to the failure of a solenoid valve which was replaced. The unit remained off-line for approximately two (2) days, returning to full service on July 1, 2017.

Mid-Cycle Outage No. 2. At 8:37 a.m. on August 28, 2017, VCSNS automatically tripped due to a turbine trip. The plant trip response was normal and

was caused by the main generator differential lockout due to a fault on the center phase 230 kilovolt lightning arrester on the main transformer. The failed arrester, along with the other two lightning arresters that were in service on the main transformer, were replaced. The failed lightning arrestors were sent to an off-site lab for testing and evaluation which revealed that moisture had penetrated the upper housing. The unit returned to full service on September 8, 2017.

Mid-Cycle Outage No. 3. At 7:57 p.m. on November 7, 2017, VCSNS automatically tripped due to a loss of digital control system power to all three main feedwater pumps, which was caused by the failure of a non-safety related inverter. Prior to trip, maintenance had been performed on the inverter resulting in the replacement of the microprocessor stack on the control board and the inverter gate card driver. Upon investigation of the plant trip, it was determined that the newly installed inverter gate card driver caused the inverter to produce an asymmetric sine wave which prevented the inverter from functioning properly. The prior gate card driver was re-installed, and the inverter has been placed in the bypass position until further corrective maintenance can be performed during RF24. The unit returned to full service on November 10, 2017.

Q. WHAT IS THE USED FUEL STORAGE CAPABILITY FOR VCSNS?

A. V.C. Summer's used fuel storage capability consists of a spent fuel pool, which is equipped with storage racks designed to hold fuel assemblies removed from the reactor, and a dry cask storage facility, which was placed in service in

January 2016. Together, SCE&G's fuel storage capability has been designed to accommodate storage of all fuel used for the life of the plant. The next transfer of used fuel from the spent fuel pool to the dry cask storage facility is scheduled to occur in 2019.

Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

A. Yes.